Anthocyanins – from pigments and plant defense to application in health, nutrition and cosmetics

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Anthocyanins are water-soluble pigments that colour the fruit and flowers of many plants. More than 635 different anthocyanins have been identified, distinguished by methylation, glycosylation and acylation with both aliphatic and aromatic groups. There is mounting evidence that consumption of anthocyanin-rich food promotes health, supported by many recent studies of anthocyanin-rich fruits such as blueberry, bilberry and cranberry. In addition to their well-documented beneficial effects on plant physiological processes as e.g. UV-protection, anthocyanins have also been proposed to function in a diverse array of plant/animal interactions. These include the attraction of pollinators and frugivores, as well as the repellence of herbivores and parasites. The optical properties of anthocyanins may serve as visual signals to potential herbivores, indicating a strong metabolic investment in toxic or unpalatable chemicals. It has been emphasized that both the defensive and the physiological functions of anthocyanins may operate in plants simultaneously. The relative abundance of anthocyanins in the human diet and their potency against a range of chronic diseases have made them the subject of intense research in experimental and preventive medicine but also for its use in nutrition, food and cosmetics and more recently for formulating natural colours. However, the limited range of anthocyanins commercially available and the expense of pure preparations mean that most research is done with crude extracts of plants which are not standardised with respect to the particular anthocyanins they contain, nor the amounts of each anthocyanin in the extract. Beside the unique plant cell cultures recently developed for the stable production of a variety of anthocyanins a sgreen factories (www.anthoplus.com) novel procedures for sustainable, high level production of diverse natural products in heterologous hosts like microorganisms show a high yield and can be up scaled to industrial production aiming to establish a robust pre-industrial production system for new, pure anthocyanins.